CIRCULATE, RETURN TO RTB FOR PROJECT FILES

SEE PGS. 4-5

RTS

RZ-CAL
REPORTS
Special
(White pine blister rust)

Bingham
~~Hanover~~
Romans

.....

.....

.....
Childears

CURRENT DEVELOPMENTS IN BLISTER RUST CONTROL INVESTIGATIONS (1958), SPECIAL REPORT--CALIFORNIA

General

All previously reported project activities were continued in California through 1958 with minor changes in emphasis due to size and "attractiveness" of problems and level of manpower. Personnel remains the same as it was a year ago. We no longer have any project responsibilities for blister rust investigations in Region 6. Miller's status-of-control plots were turned over to PNW Station late in 1957 and Quick's ribes ecology plots to PNW in June 1958. Quick is to prepare the summary of 1958 data from ecology plots on the South Umpqua Experimental Forest.

No new southerly or otherwise noteworthy extensions of blister rust were found in California this season. Intensification of the rust in northwestern California is enormous--in some spots mature sugar pines are very definitely in danger of disappearing from the stand.

Several reports concerning blister rust were published in 1958 or are now being readied for publication.

(1) Blister rust control aided by the use of chemicals for killing ribes. Offord, Quick, and Moss. Jour. Forestry 56(1):12-16. 1958.

(2) White pine blister rust in the United States. Miller, Kimmey, and Fowler. Forest Pest Leaflet. In press.

(3) Capacity and period of maximum production of sporidia in Cronartium ribicola. Bega. Phytopathology. In press.

(4) Effect of environmental factors on germination of sporidia in Cronartium ribicola. Bega. For Phytopathology. (Manuscript completed.)

(5) Spread of white pine blister rust from ribes to sugar pine in California and Oregon. USDA Technical Bulletin. Kimmey and Wagener. Editorial work nearing completion.

(6) Pathogenicity of secondary and tertiary sporidia in Cronartium ribicola. Bega. For Phytopathology. (Manuscript.)

(7) Temperature and humidity effects on teliospore viability in Cronartium ribicola. Bega and J. R. Parmeter (Plant Pathology, University of California). For Phytopathology. (Manuscript.)

(8) Electron microscope studies of sporidia of Cronartium ribicola. Bega and H. A. Scott (Plant Pathology, University of California). For Science. (Manuscript.)

(9) Infection requirements of blister rust fungi. Paper, Sixth Western International Forest Disease Work Conference, Vancouver, British Columbia, December 2-5, 1958. Bega.

Disease Studies

The status-of-disease plots established in Oregon over the years by D. R. Miller are no longer on our agenda. The Buckhorn Lodge plot (Lassen NF) and the Big Creek plot (Eldorado NF) were checked as scheduled this year by D. R. Miller and assistants. The Buckhorn Lodge plot may soon be logged. The Goat Creek plot (Shasta NF) has been rather badly disturbed by logging but was checked this year also. The Howard Creek plot (Lassen NF) was to have been checked, but ribes eradication was not completed by a contractor as expected. The canker-growth plots and the cut-canker plots at Damnation Summit (Shasta NF), Wildcat Creek (Plumas NF), and Fiddle Creek (Tahoe NF) were inspected by D. R. Miller and assistants. A summary of data from both sets of plots will be prepared this winter.

Ecology Studies

Several plots of the old ribes ecology series in California are still being checked by Quick at intervals of 1 to 5 years. Many other ecology plots in California have been discontinued. Considerable masses of plot data now need to be analyzed and reported. Ribes ecology plots on the South Umpqua Experimental Forest were checked for the last time in June. The Pacific Northwest Station (G. M. Harvey) or Region 6 (T. E. Greathouse) may start a new series of similar plots. C. R. Quick hopes in 1959 to start a series of ecologic and phenologic studies on sugar pine rust-resistant candidates in northwestern California.

Chemical Eradication

In mid-July 1957 a series of aqueous spray tests was started by C. R. Quick on old age Ribes roezli on the Bald Mtn. area (Stanislaus NF) to compare the effectiveness of standard spray treatment with 2,4-D monohydrate sodium salt with treatment with "Diax" (a powder formulation, largely isopropyl amine salt of 2,4-D) and

with "Methoxone" (sodium salt of MCP). Percent bush kill July 30, 1958, was: sodium salt of 2,4-D, 58%; Methoxone, 48%; and Diax, 46%. Sodium salt of 2,4-D is still considered to be the best.

In this same area in 1956, two plots of about 1/5 square chain (1/50 acre) were treated by H. R. Offord with 2,4-D pellets (clay flakes impregnated with volatile esters of 2,4-D). One plot was treated with ACP-L-516D (30% ethyl ester) and another with ACP-L-316 (20% ethyl ester). The test areas supported many smallish Ribes roezli bushes in dense bear clover. In mid-July 1957, one square rod (1/160 acre) of each of these plots was retreated by Quick with 2 pounds of pellets (ACP-L-516D). In 1958 all ribes, almost all of the bear clover, all of the smallish ceanothus and manzanita plants, all of the occasional ponderosa pine reproduction, and some of the incense-cedar reproduction was dead.

On June 26, 1957, at the chemical experimental site near Prattville, four plots densely stocked with 4-year-old R. roezli were treated with 2,4-D pellets. Three plots (replications) were treated at one pound per square rod rate and one at the 3 pound rate. 1958 check showed 100 percent kill of R. roezli on the four plots.

Fungicides and Use

A series of tests with "Acti-dione" (cycloheximide Upjohn) on blister rust cankers on sugar pine in the Lookout Point area (Shasta NF) was started in October 1957 by N. J. MacGregor of Region 5. Two inspections, a preliminary spring check and a more nearly final check this November, have been made. Results have not been summarized as yet. Additional tests with Acti-dione were started in November by R. Blomstrom and N. J. MacGregor. Two water-soluble forms of Acti-dione are being used as fungistatics by Quick in the sugar-pine vegetative-propagation experiments.

Microclimate Studies

Microclimate studies were continued by Bega on a smaller scale than in 1957 and this year largely concerned the use of the controlled-environment chambers in Plant Pathology, University of California, rather than use of microclimate stations in the field. Several manuscripts have been prepared. Smoke bombs and tethered balloons helped to study very local wind patterns near microclimate stations as affected by vegetation and topography. Temperature and humidity requirements and tolerances for effective functioning of aeciospores of Cronartium ribicola and C. occidentale were studied in the environment chambers. The work on pine-infecting spores and processes was continued.

Spore Dispersal

A study of statewide movements of air was made from U. S. Weather Bureau records. Methods of collecting wind-borne spores on culture media in petri dishes and on "greased" microscope slides, carried aloft by forest survey aircraft and by small captive balloons, were studied. Techniques rather than the collection of quantitative results were emphasized. Numerous fungus spores were trapped, but blister rust spores were few or absent. More effective spore trapping methods are needed. Summarization of results has not been completed.

Rust-Resistant Sugar Pines

A two-man crew again searched heavily infected areas of northwestern California (parts of the Klamath, Six Rivers, and Shasta NF's) for rust-resistant sugar pines. Our sugar pine candidates now number about 80. Of these, about 10 were found by D. R. Miller prior to 1957, about 40 were found in 1957, and about 30 in 1958. Several of these trees--in areas where rust was particularly heavy and cankers very numerous--are known to have or to have had 1 to 3 rust cankers on them. Most of the candidates are completely rust-free. Almost all candidates found in 1958 were inspected October 27-November 4 by Quick, Blomstrom, and MacGregor. Most of the trees found in 1957 were visited on the same trip to determine if open-pollinated cones were developing for maturity in 1959.

Training. C. R. Quick and Roy Blomstrom were trained in the techniques of the rust-resistant sugar-pine project at the Institute of Forest Genetics, Placerville, in April. Blomstrom spent a week with R. T. Bingham in Region 1 in June and Quick a week in August.

Grafts and Grafting. In 1956 and 1957, D. R. Miller and H. H. Bynum grafted scionwood of 9 rust-resistant candidates onto sugar pine planting stock potted in #10 tin cans. In April 1958, the Lassen NF transported to Berkeley 350 sugar pines which had been potted in 1957 as 3-0 stock at Magalia State Nursery by Miller and Bynum. In April Blomstrom and Quick collected scionwood from 11 candidate trees found in 1957 and with the aid of MacGregor grafted 15-25 individuals of each candidate onto canned stock. In June Quick collected and grafted scionwood from another four candidates, and in November Quick collected and grafted an additional two candidates. We thus have grafts of some two dozen rust-resistant candidates here at Berkeley.

Slow but continuing losses of 1956 and 1957 grafted material are most discouraging. Precise reasons for these losses are presently unknown. This year's April-collected scionwood, completely dormant at time of collection, grafted satisfactorily onto canned stock which had started growth. The June-collected material, which had developed 0.5-3.0 inches of current-season "candles" in the field, grafted exceedingly poorly. The again dormant November collections haven't been

grafted long enough to determine degree of success but look good at the moment.

In general, bottle grafts of sugar pine show slightly higher percentages early survival than cleft grafts, but cleft grafts subsequently show more vigor and greater normality of growth. Tip-cleft grafts (where there is some foliage on the stock below the graft) seem more generally successful than stump cleft grafts (where the stock is cut down ot a 1.5-3.0 inch stump). Slow continuing losses of apparently successful grafts, and even of unmutilated canned stock, may indicate that Berkeley, with its fog-overcast summers and mild winters, simply is not satisfactory for sugar pine growth. Fifty vigorous grafts in cans were taken to the Magalia State Nursery (California Division of Forestry) in August. Next spring plans are to take all grafted sugar pine material to the newly established Region 5-Eldorado NF forest nursery near Placerville. A moderate size lathhouse and an outside platform for canned stock and grafted material is planned for the rust-resistant sugar pine project at this nursery.

Experiments with fertilizers, plant hormones, degrees of watering, etc. at Berkeley have not markedly aided growth and vigor of sugar pine stock nor grafts. Attempts to force development of dormant and semidormant buds on weakly attached grafts with Gibberellin (Merck) were completely unsuccessful--the plants all died.

Vegetative Propagation. A simple rapid method for propagating clones of rust-resistant candidates would be a great boon. About 250 cultures of sugar-pine cuttings, mostly needle-bundle cuttings but some lateral-stem cuttings, have been prepared. A rather wide variety of plant hormones, weed killers, fungicides, carbohydrates, etc. have been used in these cutting cultures. So far one needle-bundle cutting and one stem cutting developed roots, but no complete plant subsequently developed in either case. Experimentation continues.

C. R. Quick
California Forest and Range
Experiment Station
Berkeley, California
November 21, 1958